

5 WHAT IS CLAIMED IS:

1. A semiconductor component comprising:
  - a stiffener comprising a metal sheet, an adhesive layer on the metal sheet, a plurality of conductors in physical contact with the adhesive layer, and a polymer mask on the conductors;
  - a semiconductor die attached to the stiffener in electrical communication with the conductors; and
  - a plurality of terminal contacts on the conductors electrically isolated by the polymer mask.
2. The semiconductor component of claim 1 wherein the terminal contacts comprise balls or bumps in an area array.
- 20 3. The semiconductor component of claim 1 wherein the conductors comprise a plurality of contacts in an area array and the terminal contacts are formed on the contacts.
4. The semiconductor component of claim 1 further comprising a die encapsulant on the stiffener encapsulating the die.
- 25 5. The semiconductor component of claim 1 wherein the polymer mask comprises a solder mask.
- 30 6. The semiconductor component of claim 1 wherein the stiffener comprises a metal selected from the group consisting of stainless steel, copper, nickel, titanium, aluminum, and alloys of these metals.
- 35 7. A semiconductor component comprising:
  - a stiffener;

5           a circuit decal attached to the stiffener comprising a plurality of conductors and an outer polymer mask on the conductors;

10           an electrically insulating adhesive layer in physical contact with the conductors attaching the circuit decal to the stiffener; and

              a semiconductor die attached to the stiffener in electrical communication with the conductors.

8.   The semiconductor component of claim 7 further  
15 comprising a plurality of terminal contacts on the conductors electrically isolated by the polymer mask.

9.   The semiconductor component of claim 7 wherein the conductors comprise a plurality of contacts for the  
20 terminal contacts in an area array.

10.   The semiconductor component of claim 7 further comprising a second semiconductor die attached to the stiffener.

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11.   A semiconductor component comprising:

          a stiffener;

          a semiconductor die attached to the stiffener;

30           a circuit decal attached to the stiffener comprising a plurality of conductors and a polymer layer on the conductors;

              an electrically insulating adhesive layer in physical contact with the stiffener and the conductors, the adhesive layer attaching the circuit decal to the stiffener  
35           with the polymer layer forming an exterior surface of the component;

              a plurality of interconnects electrically connecting the die and the conductors; and

5           a plurality of terminal contacts on the conductors electrically isolated by the polymer layer.

12. The semiconductor component of claim 11 wherein the stiffener comprises a metal.

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13. The semiconductor component of claim 11 wherein the interconnects comprise wires bonded to the die and to the conductors.

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14. The semiconductor component of claim 11 further comprising a die encapsulant on the stiffener encapsulating the die.

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15. The semiconductor component of claim 11 further comprising an interconnect encapsulant on the stiffener encapsulating the interconnects.

16. The semiconductor component of claim 11 wherein the terminal contacts are arranged in an area array.

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17. The semiconductor component of claim 11 wherein the stiffener includes a wire bonding opening, and the die includes a circuit die bonded to the stiffener, and a plurality of die contacts aligned with the wire bonding opening and wire bonded to the conductors.

18. The semiconductor component of claim 11 wherein the component comprises a ball grid array package.

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19. The semiconductor component of claim 11 wherein the component comprises a multi chip module.

20. A semiconductor component comprising:  
a metal stiffener;

5           a semiconductor die on the stiffener;  
a circuit decal comprising a plurality of conductors having contacts thereon in an area array, and a polymer mask layer on the conductors having a plurality of openings therein aligned with the contacts;  
10          an electrically insulating adhesive layer in physical contact with the stiffener and the conductors, attaching the circuit decal to the stiffener;  
              a plurality of interconnects electrically connecting the die and the conductors; and  
15          a plurality of terminal contacts on the contacts electrically isolated by the mask layer.

21. The semiconductor component of claim 20 wherein the terminal contacts comprise solder balls or bumps and  
20 the polymer mask layer comprises a solder mask.

22. The semiconductor component of claim 20 further comprising a plurality of interconnect contacts on the conductors for bonding the interconnects to the circuit  
25 decal.

23. The semiconductor component of claim 20 wherein the stiffener includes an opening and the die includes a plurality of die contacts aligned with the opening and wire  
30 bonded to the conductors.

24. The semiconductor component of claim 20 wherein the die is attached to the stiffener in a board on chip configuration.

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25. The semiconductor component of claim 20 further comprising a die encapsulant on the stiffener encapsulating the die.

5        26. The semiconductor component of claim 20 further comprising an interconnect encapsulant on the stiffener encapsulating the interconnects.

10      27. The semiconductor component of claim 20 wherein the stiffener comprises a metal selected from the group consisting of stainless steel, copper, nickel, titanium, aluminum, and alloys of these metals.

15      28. A semiconductor component comprising:  
          a stiffener comprising a metal plate having a wire bonding opening, a plurality of conductors on the metal plate having contacts in an area array, an adhesive layer attaching and electrically insulating the conductors on the metal plate, and a solder mask on the conductors  
20     having openings aligned with the contacts;

          a semiconductor die having a circuit side attached to the stiffener and a plurality of die contacts aligned with the wire bonding opening;

25     a plurality of wire interconnects wire bonded to the die contacts and to the conductors; and  
          a plurality of terminal contacts on the contacts.

30      29. The component of claim 28 wherein the terminal contacts comprise solder bumps or balls and the area array comprises a grid array.

35      30. The component of claim 28 further comprising a die encapsulant on the stiffener encapsulating the die.

35      31.. The component of claim 28 further comprising an interconnect encapsulant in the wire bonding opening encapsulating the wire interconnects.

5        32. The component of claim 28 wherein the solder mask  
comprises a photoimageable polymer.

10      33. The component of claim 28 further comprising a  
plurality of dice on the stiffener.

15      34. The component of claim 28 wherein the component  
comprises a ball grid array package.

20      35. The component of claim 28 wherein the component  
comprises a multi chip module.

25      36. A semiconductor component comprising:

30      a stiffener having a first side, an opposing  
second side and a plurality of conductive vias from the  
first side to the second side;

35      a first circuit decal attached to the first side  
comprising a plurality of first conductors in electrical  
communication with the conductive vias, a plurality of  
first contacts in electrical communication with the first  
conductors and a first polymer mask on the first  
conductors;

40      a second circuit decal attached to the second  
side comprising a plurality of second conductors in electrical  
communication with the conductive vias, a plurality of  
second contacts in electrical communication with the second  
conductors and a second polymer mask on the second  
conductors;

45      a semiconductor die back bonded to the stiffener;  
and

50      a plurality of interconnects bonded to the die  
and to the second contacts.

5       37. The semiconductor component of claim 36 further comprising a plurality of terminal contacts on the first contacts.

10      38. The semiconductor component of claim 37 wherein the first contacts are arranged in an area array and the terminal contacts comprise balls or bumps.

15      39. The semiconductor component of claim 36 wherein the conductive vias comprise an electrically insulating material configured to insulate the conductive vias from the stiffener.

20      40. The semiconductor component of claim 36 further comprising a second die stacked on the die and interconnected to the second circuit decal.

25      41. A semiconductor component comprising:  
          a stiffener having a first side, an opposing second side and a plurality of conductive vias from the first side to the second side;

30      a first circuit decal attached to the first side comprising a plurality of first conductors in electrical communication with the conductive vias, a plurality of first contacts in electrical communication with the first conductors and a first polymer mask on the first conductors;

35      a second circuit decal attached to the second side comprising a plurality of second conductors in electrical communication with the conductive vias, a plurality of second contacts in electrical communication with the second conductors, a second polymer mask on the second conductors and a plurality of third contacts in electrical communication with the second conductors;

5           a first semiconductor die back bonded to the  
stiffener;

              a second semiconductor die stacked on the first  
die;

10          a plurality of first interconnects bonded to the  
first die and to the first contacts;

              a plurality of second interconnects bonded to the  
second die and to the second contacts; and

              a plurality of terminal contacts on the third  
contacts.

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42.       The component of claim 41 wherein the terminal  
contacts comprise balls or bumps and the third contacts are  
arranged in an area array.

20        43.   A method for fabricating a semiconductor  
component comprising:

              providing a metal stiffener;

              providing a circuit decal comprising a plurality  
of conductors and a polymer mask on the conductors;

25        attaching the circuit decal to the stiffener by  
forming an adhesive layer in physical contact with the  
stiffener and the conductors;

              attaching a semiconductor die to the stiffener in  
electrical communication with the conductors; and

30        forming a plurality of terminal contacts on the  
conductors electrically isolated by the polymer mask.

44.       The method of claim 43 wherein the attaching the  
semiconductor die step comprises adhesively bonding the die  
35      to the stiffener and wire bonding the die to the  
conductors.

45.       The method of claim 43 further comprising  
encapsulating the die.

46. The method of claim 43 further comprising providing the conductors with a plurality of contacts in an area array for forming the terminal contacts.

10 47. The method of claim 43 wherein the stiffener comprises a metal selected from the group consisting of stainless steel, copper, nickel, titanium, aluminum, and alloys of these metals.

15 48. The method of claim 43 wherein the polymer mask comprises a photoimageable polymer having a plurality of openings for the terminal contacts.

20 49. The method of claim 43 wherein the providing the stiffener step comprises providing a metal strip containing the stiffener and a plurality of stiffeners.

25 50. The method of claim 43 wherein the providing the circuit decal comprises providing a decal strip containing the circuit decal and a plurality of circuit decals.

51. A method for fabricating a semiconductor component comprising:

30 providing a stiffener comprising a metal plate, a circuit decal attached to the metal plate comprising a plurality of conductors having contacts in an area array and a polymer mask on the conductors, and an electrically insulating adhesive layer in physical contact with the metal plate and the conductors;

35 attaching a semiconductor die to the stiffener in electrical communication with the conductors; and

forming a plurality of terminal contacts on the contacts using the polymer mask.

5        52. The method of claim 51 wherein the attaching the die step comprises bonding a circuit side of the die to the stiffener and wire bonding the die to the conductors.

10      53. The method of claim 51 wherein the forming the terminal contacts step comprising depositing solder bumps on the contacts.

15      54. The method of claim 51 wherein the forming the terminal contacts step comprising bonding solder balls to the contacts.

55. The method of claim 51 wherein the stiffener is contained on a strip comprising a plurality of stiffeners.

20      56. The method of claim 51 wherein the circuit decal is contained on a strip comprising a plurality of circuit decals.

25      57. The method of claim 51 wherein the component comprises a ball grid array package.

58. The method of claim 51 wherein the component comprises a multi chip module.

30      59. A method for fabricating a semiconductor component comprising:

      providing a metal strip comprising a plurality of stiffeners;

35      providing a decal strip comprising a plurality of circuit decals, each circuit decal comprising a plurality of conductors having contacts in an area array, and a solder mask on the conductors having a plurality of openings aligned with the contacts;

5 forming an electrically insulating adhesive layer between the metal strip and the decal strip in physical contact with the conductors;

attaching a plurality of dice to the metal strip in electrical communication with the conductors;

10 forming a plurality of terminal contacts in the openings on the contacts; and

singulating a stiffener, a circuit decal and a die from the metal strip.

15 60. The method of claim 59 wherein the attaching the plurality of dice step is performed by adhesively bonding circuit sides of the dice to the metal strip in a board on chip configuration.

20 61. The method of claim 59 wherein the forming the terminal contacts step comprises forming solder bumps or balls in the openings.

25 62. The method of claim 59 wherein the forming the terminal contacts step comprises bonding solder balls to the contacts.

63. The method of claim 59 further comprising encapsulating the dice on the metal strip.

30 64. The method of claim 59 wherein the attaching the dice step comprises wire bonding.

65. The method of claim 59 wherein the conductors comprise a plurality of interconnect contacts for wire bonding to the dice.

66. A method for fabricating a semiconductor component comprising:

5       providing a metal stiffener;  
      providing a circuit decal comprising a metallization  
layer and an outer polymer layer;  
      forming an electrically insulating adhesive layer  
between the metallization layer and the metal stiffener;  
10      attaching a semiconductor die to the stiffener;  
      forming a plurality of interconnects between the die  
and the metallization layer; and  
      forming a plurality of terminal contacts on the  
metallization layer.

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67. The method of claim 66 further comprising  
encapsulating the die.

68. The method of claim 66 wherein the forming the  
20 interconnects step comprises wire bonding.

69. The method of claim 66 wherein the metallization  
layer comprises copper.

25      70. The method of claim 66 wherein the metallization  
layer comprises a plurality of contacts for the terminal  
contacts in an area array.

30      71. The method of claim 66 wherein the terminal  
contacts comprise solder bumps or balls and the outer  
polymer layer comprises a solder mask.

72. The method of claim 66 wherein the providing the  
metal stiffener step comprises providing a metal strip  
35 containing a plurality of stiffeners.

73. The method of claim 66 wherein the providing the  
circuit decal step comprises providing a decal strip  
containing a plurality of circuit decals.

74. The method of claim 66 wherein the attaching the die to the stiffener step comprises adhesively bonding a circuit side of the die to the stiffener.

10 75. A system comprising:

a substrate; and

a semiconductor component on the substrate comprising a stiffener comprising a metal sheet, an adhesive layer on the metal sheet, a plurality of conductors in physical contact with the adhesive layer, and a polymer mask on the conductors, a semiconductor die attached to the stiffener in electrical communication with the conductors, and a plurality of terminal contacts on the conductors electrically isolated by the polymer mask.

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76. The system of claim 75 wherein the substrate comprises a module substrate and the system comprises a multi chip module.

25 77. The system of claim 75 wherein the substrate is contained in a computer.

78. The system of claim 75 wherein the substrate is contained in a camcorder.

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79. The system of claim 75 wherein the substrate is contained in a camera.

80. The system of claim 75 wherein the substrate is 35 contained in a cell phone.

5        81. A system comprising:  
          a substrate comprising a plurality of electrodes; and  
          a semiconductor component on the substrate comprising:  
            a stiffener;  
            a semiconductor die attached to the stiffener;  
10        a circuit decal attached to the stiffener comprising a plurality of conductors and a polymer layer on the conductors;  
            an electrically insulating adhesive layer in physical contact with the stiffener and the conductors, the adhesive layer attaching the circuit decal to the stiffener with the polymer layer forming an exterior surface of the component;  
15        a plurality of interconnects electrically connecting the die and the conductors; and  
            a plurality of terminal contacts on the conductors electrically isolated by the polymer layer and bonded to the electrodes.

20        82. The system of claim 81 wherein the system comprises a multi chip module, a computer, a camcorder, a camera or a cell phone.

25        83. The system of claim 81 further comprising a plurality of dice on the stiffener.

30        84. The system of claim 81 further comprising a plurality of components on the substrate substantially identical to the component.

35        85. The system of claim 81 further comprising a plurality of components on the substrate substantially

5 identical to the component but having a different  
electrical configuration.

86. The system of claim 81 wherein the polymer layer  
comprises a solder mask and the terminal contacts comprise  
10 solder bumps or balls.

87. The system of claim 81 further comprising a die  
encapsulant on the die.